



WATER RESOURCES RESEARCH GRANT PROPOSAL

Project ID: 2005AL36B

Title: Spatial Dynamics of Runoff-Contributing Areas for Effective Management of Phosphorus from Land-Applied Poultry Litter

Project Type: Research

Focus Categories: Hydrology, Non Point Pollution, Agriculture

Keywords: Surface Water, Variable Source Area, Phosphorus, Poultry Litter, Sediment

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Abstract

Alabama's agricultural economy depends on poultry production. Confined poultry production, however, results in massive amounts of litter and associated phosphorus (P). Land application of litter to pastures, as a cheap alternative to commercial fertilizer, has resulted in excessive buildup of P in soils in major poultry producing counties in Alabama. While P is an essential nutrient for plant growth, runoff of P can accelerate eutrophication resulting in severe impairment of waterbodies that support aquatic, recreational and drinking water uses. Because of excessive buildup of P in soils and the resulting threat to our water quality, recent years have seen the development of a P-index in major poultry producing states of the country. Alabama's P-index suggests applying litter based on agronomic P requirement rather than agronomic N requirement to those fields that have mid- or high-field vulnerability ratings. Since poultry litter has a high P to N ratio, this recommendation has resulted in a great imbalance in the amount of poultry litter produced and the area available for litter application.

Current P management practices, however, treat an entire field as on homogeneous unit. The underlying assumption is that an entire field contributes to surface runoff. Several studies have shown that runoff is generated from well-defined and often identifiable portions of a watershed. Extrapolating based on the results of these studies, we contend that up to 90% of areas within those fields might be suitable for poultry litter application at a higher rate because probability of these areas generating runoff is extremely low. Through an intensively-instrumented field study we propose to identify those areas (i.e., runoff-contributing areas) in the Sand Mountain region of Alabama where major poultry producing counties are located. Since the primary mechanism of P transport is surface runoff, it is believed that consideration of hydrologic controls and identification of runoff-contributing areas are critical for effective management of P. Specific objectives of this proposed research are to (1) develop and implement a field-scale methodology to measure the location of runoff-contributing areas and identify runoff generation mechanism, and (2) relate the spatial variability of runoff-contributing areas and runoff generation mechanism to static and dynamic watershed hydrologic characteristics.